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INSTALLATION PLAN FOR ADDITIONAL OFF-SITE WELLS SOUTH OF THE FMPC DECEMBER 1988

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INSTALLATION PLAN FOR ADDITIONAL OFF-SITE WELLS SOUTH OF THE FMPC

FOR THE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

FERNALD, OHIO

DECEMBER 1988

INSTALLATION PLAN FOR ADDITIONAL OFF-SITE WELLS SOUTH OF THE FMPC FOR THE RI/FS

1.0 INTRODUCTION

The presence of elevated levels of uranium in the Great Miami Aquifer at off-site locations to the south of the Feed Materials Production Center (FMPC) has been known for some time. Both the source(s) and the extent of this uranium plume were raised as investigative issues in the Remedial Investigation/Feasibility Study (RI/FS) Work Plan. The completed phase of well installation and monitoring and initial data analysis have provided valuable insight into these issues. In particular, the available data support the expected finding that the principal source of the plume is, or was, centered in the vicinity of the confluence of the storm water outfall ditch with Paddy's Run, the fly ash piles, and the southfield area.

The data from Rounds 1 and 2 of the quarterly ground water monitoring program have been evaluated to determine the need for additional wells to further resolve the south plume issues. The interim results of the ongoing ground water modeling effort have been used as additional input to this evaluation. As a result of this evaluation, a proposal for additional on-site wells was recently issued to the U.S. Environmental Protection Agency (U.S. EPA) to better pinpoint the past and/or current sources of uranium in ground water to the south of the FMPC.

The purpose of this memorandum is to propose, with justification, a series of off-site wells to the south to bound the southern plume, and to determine the location of the maximum uranium concentration within the plume. An initial approach to this program was discussed with the U.S. EPA at an interagency working session on October 28, 1988. The increase from seven to 10 wells in the program are due to more recent findings of the RI/FS continuing data analysis effort.

2.0 FINDINGS TO DATE

Figure 1 presents the levels of total uranium detected in ground water in the southern wells during the first two rounds of quarterly monitoring under the RI/FS and previous monitoring programs. A cursory evaluation of this data indicates that the uranium plume is centered within 2,000 feet of the southern boundary of the FMPC and is bounded by other wells installed to the east and south of the impacted area. These monitoring results are generally consistent with the local ground water flow patterns, which are controlled by local ground water pumping and a steep

potentiometric gradient to the south. The locations of highest observed uranium levels are also generally consistent with preliminary modeling results.

The highest levels of uranium are observed to be in the 2000-Series wells which are screened near the top of the sand and gravel aquifer. An exception is at Well Location 62 which may be explained by the heavy pumpage of the associated well at depths corresponding to a 3000-Series well -- pumpage that could locally draw uranium into deeper portions of the aquifer. The capture zone resulting from this pumpage is also being evaluated as a controlling factor in the southern migration of the plume.

Although these simplified explanations remain plausible, several complicating issues require further evaluation through the proposed well program. These include:

- An easterly component of ground water flow merges with the regional southern flow pattern in the vicinity of the observed off-site plume. The aforementioned interpretation assumes that the southerly flow component continues to dominate and control uranium migration. Confirmation that the plume is not trending to the east is necessary to substantiate that wells at Locations 93 and 94 (Figure 1) demarcate the limits of the plume to the east and southeast.

- The continued, consistent presence of relatively high levels of uranium in the pumping well at Location 62 brings into question that the point of maximum concentration of the uranium plume is represented by the existing wells in the area. Preliminary modeling results indicate that the true center of the plume could lie slightly to the east and south of the existing location of highest uranium readings. The issue is important in the development of remedial action alternatives and in the evaluation of the effects on the pumping well.

- Two additional issues related to the pumping well are whether significant amounts of uranium are being drawn in from the west (due, for example, to releases from Paddy's Run), and whether the downward movement of uranium caused by the pumping stresses creates a more extensive area of elevated uranium at the 3000-Series level than is currently being monitored.

- Significant changes in geochemical conditions, due to the possible presence of contaminates from one or both of the chemical plants in the area, are thought to exist in the aquifer just south of the observed plume. A question arises as to whether the geochemical conditions, rather than the pumping center, are the

principal factor limiting the southern migration of the plume. The possibility also remains that the plume has simply not yet reached points further to the south and is not being fully controlled by either geochemical processes or pumping.

- o A possibility exists that a secondary plume originating in Paddy's Run lies south of the current monitoring well network. This is an important consideration due to the presence of private wells at residences further south of Paddy's Run. The possibility of a secondary plume is somewhat evidenced by readings on the order of 10 ug/l of total uranium in a 3000-Series well that was previously monitored (and since abandoned) along Paddy's Run to the west of Location 62. This level was reported in 1985 at Well Location TW-2 (Figure 1). The observation that the deeper wells exhibit higher uranium values than shallow wells at the same location is an important deviation from the characteristics of the previously discussed southern plume. One explanation is that uranium from historic releases is now located deeper in the aquifer due to continuing recharge from Paddy's Run.

3.0 PROPOSED WELL PROGRAM

To address the aforementioned issues, a series of ten additional monitoring wells at six locations is proposed at off-site locations to the south of the FMPC. The specific locations and depths of the wells are shown in Figure 1 and are justified as follows:

Well Location 1: 2000-Series well located between and west of Well Locations 93 and 94 to confirm that the southern plume does not have an eastward component resulting from the local hydrogeologic setting. The proposed 2000-Series level is consistent with the principal depth of uranium detection in areas to the west.

Well Location 2: 2000- and 3000-Series wells located just to the north-west of the pumping center (Well 3062) to establish the degree of uranium contribution to the pumping wells from the northwest.

Well Location 3: 2000- and 3000-Series wells located along Paddy's Run south of the previous location of Well TW-2 where elevated levels of uranium were detected in the deeper zone. This location will also provide an intermediate monitoring point along Paddy's Run between the previously installed on-site wells and the proposed wells at Location 4 (see below).

Well Location 4: 2000- and 3000-Series wells located at a point south of Paddy's Run and just north of several private residences. These wells would lie within the downgradient flow path for ground water flowing from the observed uranium plume. Consequently, this location serves the dual purpose of monitoring potential ground water impacts associated with recharge from Paddy's Run, as well as providing an additional monitoring point further downgradient from the primary southern plume.

Well Location 5: 2000- and 3000-Series wells located at the point predicted by the analytical solute transport model to be the approximate center of the uranium plume. These wells will help confirm the overall strength of the plume, as well as provide data on the relative contributions of flow and uranium to the pumping wells from the southeast. The latter evaluation will also indicate the degree of plume control achieved by the pumping wells.

Well Location 6: 2000-Series well located south of the predicted center of the plume, but north of the principal zone of geochemical change. This well will provide additional evidence on the extent of uranium migration and could resolve the issue of what process has controlled (or is controlling) the southern movement of the plume.

Each of the proposed wells will also provide data on the local potentiometric gradients created by pumping well 3062 and the bedrock trough for purposes of the hydrogeologic evaluation and ground water model calibration.

4.0 WELL INSTALLATION AND SUBSURFACE SOIL SAMPLING

Subsurface soil samples will be collected during drilling under the same procedures as are described in the RI/FS Work Plan Revision 3. Well construction and well materials, as well as field screening for radionuclides and organic contaminants, will also be the same as specified in the RI/FS Work Plan, Revision 3.

5.0 GROUND WATER QUALITY SAMPLING

Ground water quality samples will be collected from each of the 10 wells. These samples will be submitted for total uranium and the general ground water parameters as specified in the RI/FS Work Plan.

The ten wells will be sampled two times, May and July 1989, to provide at least two data points for each well. In both samplings, the analysis will be for the full radiological analysis and the general water quality parameters as specified in the RI/FS Work Plan Revision 3.

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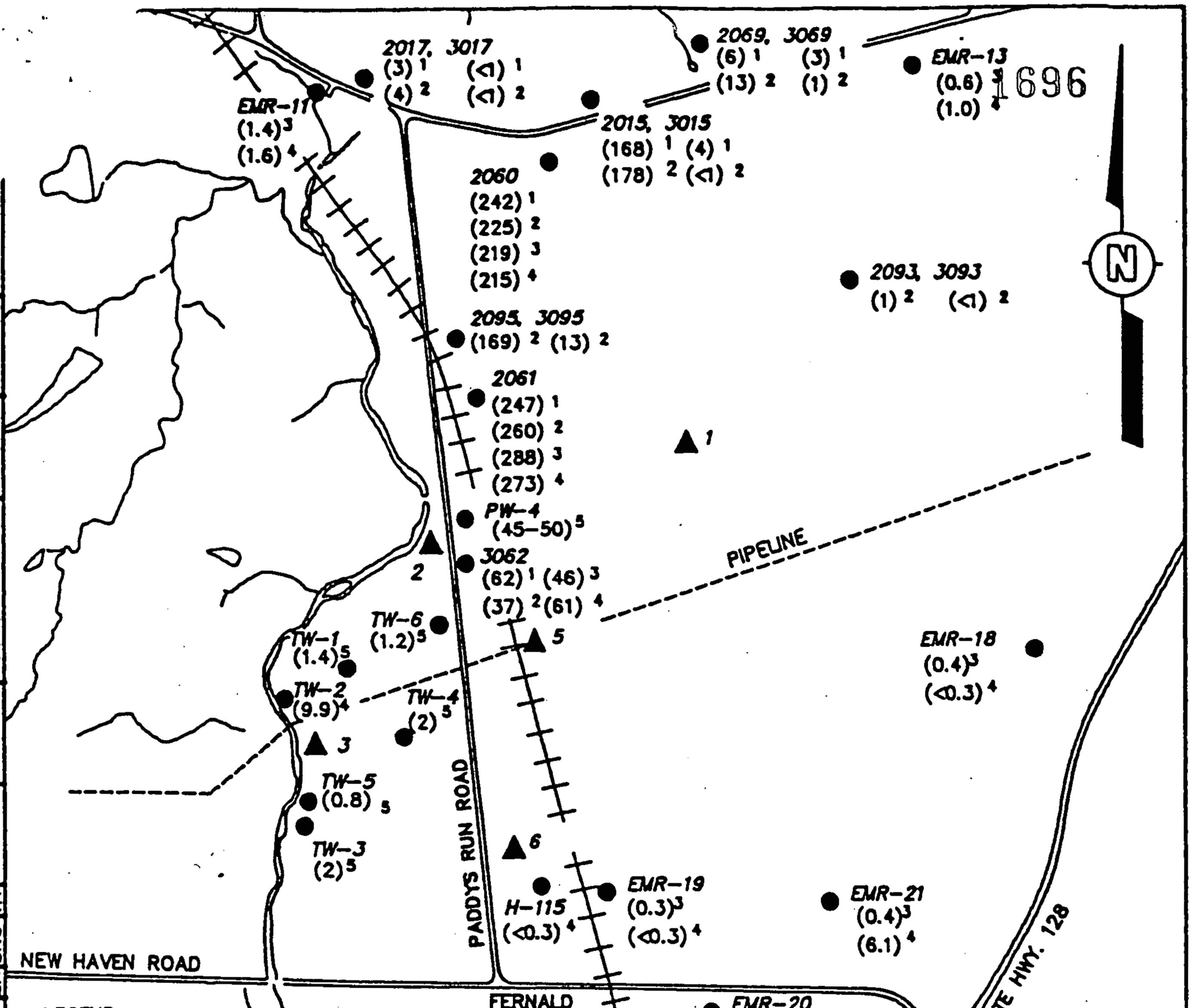

LEGEND

● 3062 EXISTING WELLS

(62) 1 RI/FS ROUND 1 URANIUM CONCENTRATION; µg/l

(37) 2 RI/FS ROUND 2 URANIUM CONCENTRATION: µg/l

(46) 3 WMCO ENVIRONMENTAL MONITORING REPORT AVERAGE 1986 URANIUM CONCENTRATION µg/l CALCULATED USING 1pCi=1.4925 µg/l

(61) 4 IT LITIGATION URANIUM CONCENTRATION µg/l CALCULATED USING 1pCi=1.4925 µg/l

(2) 5 TOTAL URANIUM DATA RECIEVED FROM ALBRIGHT AND WILSON 4/11/86. CONCENTRATION IN ppb (OR µg/l)

▲6 PROPOSED WELL CLUSTER; 2000 AND/OR 3000 SERIES WELLS

NOTE:

MONITORING WELLS MAY HAVE BEEN REMOVED.

SCALE

0 500 1000 1500

FIGURE 1

SOUTH PLUME MONITORING WELLS

PREPARED FOR

FERNALD RI/FS
U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

DRAWING NUMBER | CHECKED BY | APPROVED BY | R. Weible | 10-27-88 | DRAWN BY | 1A | 1A | 100% | ORG | 2A | 2A | 100% | BLU

132298

"Do Not Scale This Drawing"